University Avenue Rehabilitation & Widening 63213

DRAFT Safety Analysis Update – 2003 through 2012

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Abbreviations

AADT	Annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
ADOT&PF	Alaska Department of Transportation and Public Facilities
HSIP	Highway Safety Improvement Program
HSM	Highway Safety Manual
ITE	Institute of Transportation Engineers
KE	Kinney Engineering, LLC
MEV	Million entering vehicles
MVM	Million vehicle-miles
NCHRP	National Cooperative Highway Research Program
UCL	Upper control limit

Executive Summary

Kinney Engineering, LLC (KE) was retained by the Alaska Department of Transportation and Public Facilities (ADOT&PF) Northern Region to provide an updated safety analysis for the University Avenue Rehabilitation and Widening project along University Avenue in Fairbanks, Alaska using the most recent 10 years of crash data (2003 through 2012). The purpose of updating the analysis is to determine if there are any new crash trends to consider as the design moves forward and to examine the effect of the proposed design on crashes.

KE identified four intersections as having crash rates that were statistically higher than expected based on average crash rates for similar intersections across the state. These are:

- Davis Road
- Airport Way
- Geist Road/Johansen Expressway
- Sandvik Street

No segments had crash rates that were statistically higher than expected based on average crash rates for similar segments across the state.

Crash types that are most prevalent in the study area include rear end crashes and left turn crashes.

The proposed design will mitigate the existing crash patterns by installing a center raised median with left turn lanes at median openings at key intersections. Many of the left turn lanes will be offset to improve sight distance for opposing left turn vehicles. In addition, channelized right turn lanes will be installed at two approaches to the Geist Road/Johansen Expressway intersection and the phasing for eastbound and westbound left turns at the Geist Road intersection will change to protected-only.

There were 926 recorded crashes in the study area during the study period. If the improvements proposed with the University Avenue Rehabilitation and Widening project had been constructed throughout this time period, it is expected that there would have been 113 to 123 fewer crashes.

1 Introduction

This report presents the results of an updated safety analysis for the University Avenue Rehabilitation and Widening project along University Avenue in Fairbanks, Alaska. The Environmental Assessment report for this project (August 2005) includes a summary of the crash history for University Avenue from 1994 through 2003. The Alaska Department of Transportation and Public Facilities Northern Region (ADOT&PF) retained Kinney Engineering, LLC (KE) to update this safety analysis using crash data from 2003 through 2012.

This updated analysis identifies:

- Crash trends from 2003 through 2012
- Project area locations with higher than expected crash rates and crash patterns at these locations
- Crash reductions expected based on proposed design

University Avenue is a four-lane undivided highway classified as a principal arterial in the City of Fairbanks, Alaska. The study area is between the Robert Mitchell Expressway and Alumni Drive/College Road, excluding these two intersections. (See Figure 1.) The proposed design would construct two northbound and two southbound lanes separated by a raised median, with median openings at key intersections. In addition, major intersections will be channelized for auxiliary left-turn and right-turn lanes.

For reference, Table 1 presents historical and projected 2035 annual average daily traffic (AADT) volumes.

Segment	AADTs	
	2010	2035
Mitchell Expressway to Davis Road	6,755	14,041
Davis Road to Rewak Drive	9,760	15,307
Rewak Drive to Chena River	20,120	23,016
Chena River to Geist Road/Johansen Expressway	18,340	23,417
Geist Road/Johansen Expressway to College Road	21,450	22,944

Table 1 - Historical and Projected Traffic Volumes

Figure 1 – University Avenue Study Area Map

2 Corridor Crash Overview: 2003 to 2012

There were 926 recorded crashes on University Avenue from the Mitchell Expressway (Parks Highway) to College/Alumni Road (excluding the intersections at each end) from 2003 through 2012. Figure 2 shows the distribution of these crashes by year and severity. The figure shows that the total number of crashes in this corridor varies each year, with a spike in the number of crashes in 2004.

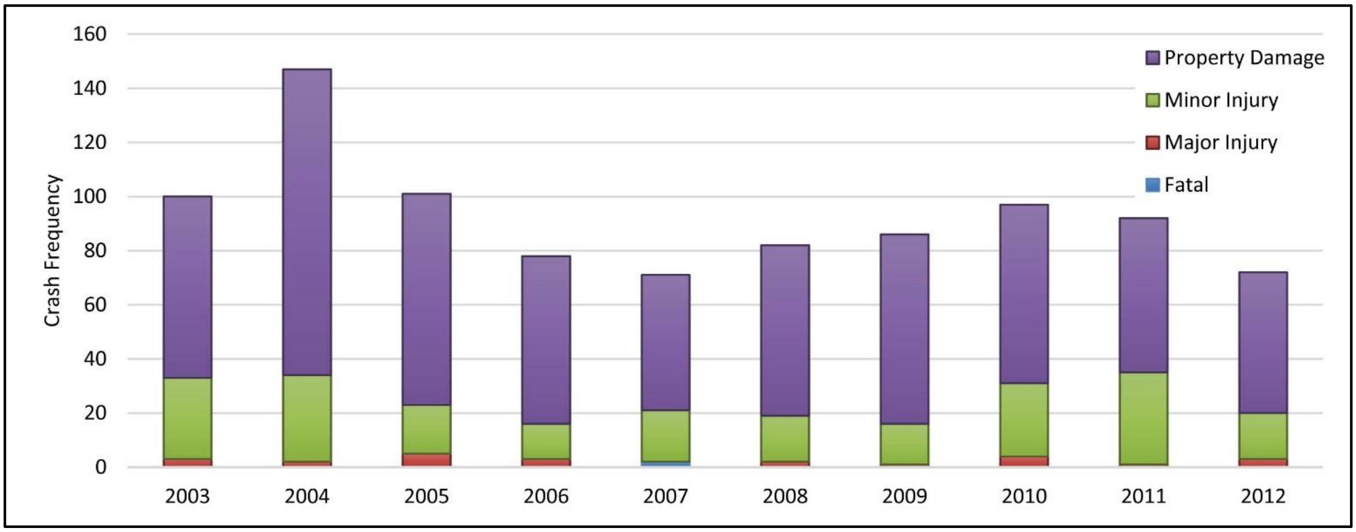

Figure 2 - Corridor Crash History by Severity 2003 through 2012

There were 2 fatal crashes during the 10-year study period. Both of these occurred at the Geist Road/Johansen Expressway intersection in 2007. The first of these was a sideswipe crash that occurred in July between two southbound motorcyclists who were turning left simultaneously. The second fatal crash occurred in August when a northbound bicyclist entered the crosswalk against the pedestrian signal and was struck by an eastbound passenger car.

2.1 Crash Type

Figure 3 presents the crash types for crashes that occurred during the study period. Figure 4 illustrates common two-vehicle crash types. Table 2 shows how the percentage of crashes in certain categories has changed from when the Environmental Assessment was completed (using crashes from 1994 through 2003) to this analysis (2003 through 2012). Rear end crashes remain the most frequent crash type in the corridor and the percentage of rear end crashes has increased. Crashes related to intersections (right angle, left turn, etc.) have decreased in percentage, but still make up just under a third of all corridor crashes.

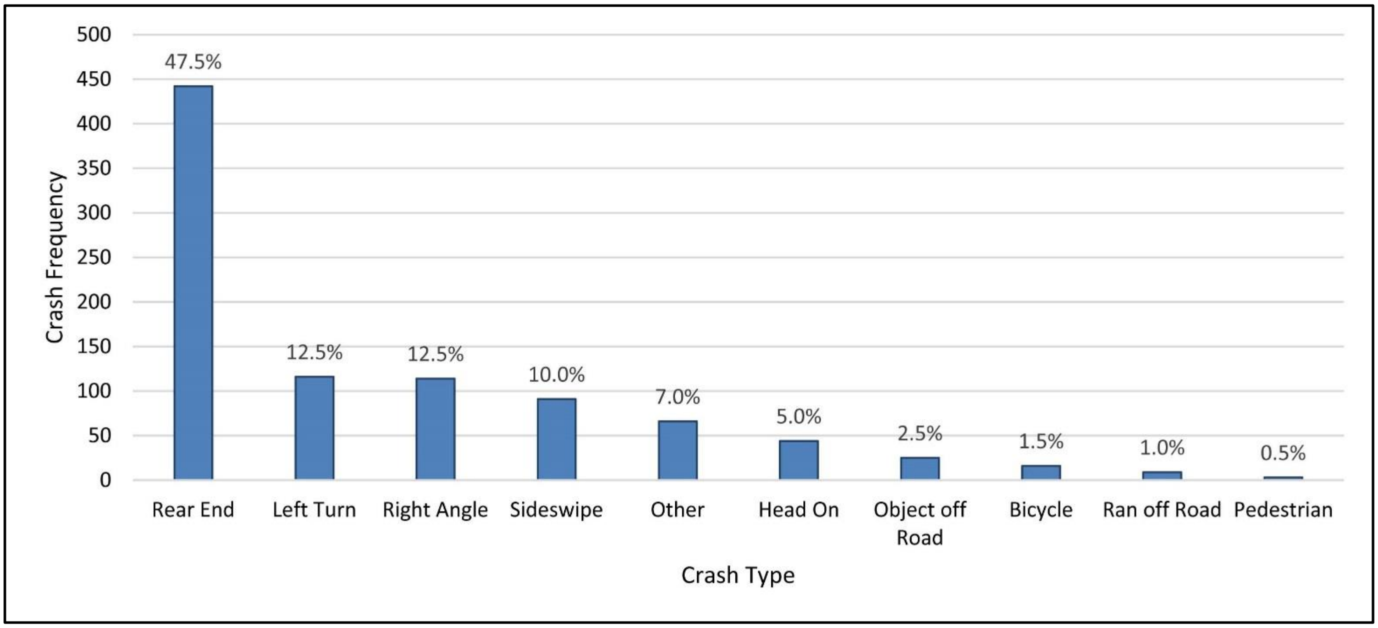

Figure 3 – Percentage of Crashes by Crash Type (2003 through 2012)

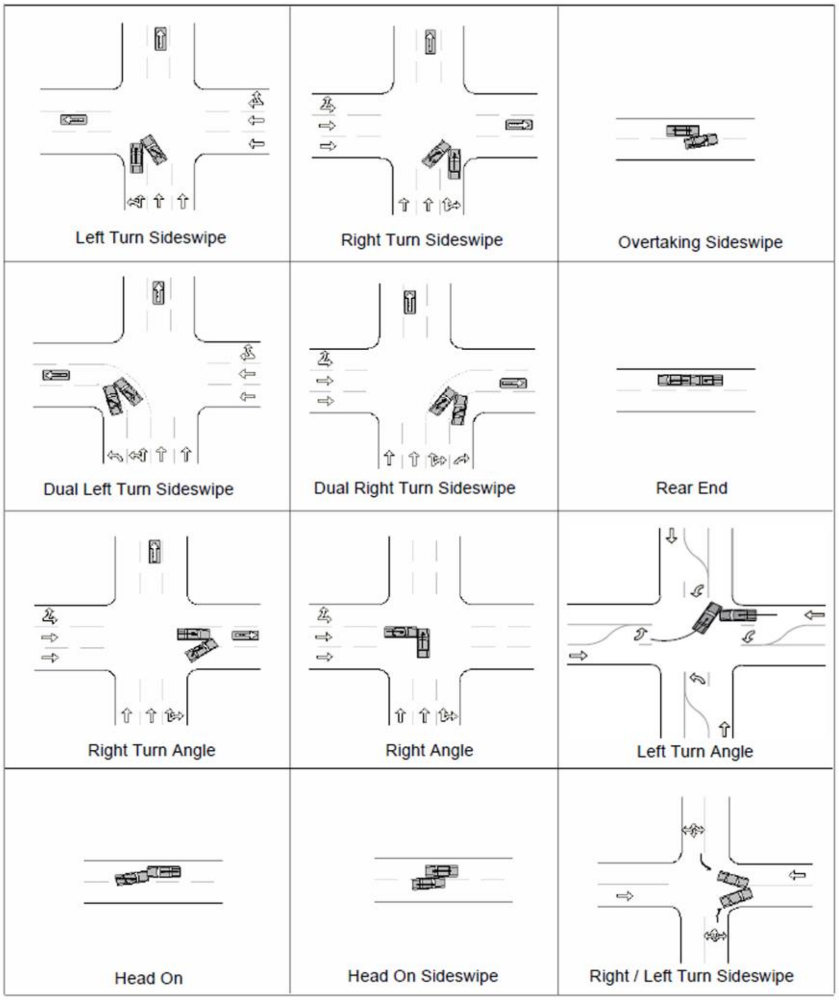

Figure 4 – Illustration of Two-Vehicle Crash Types (SOURCE: Annual Traffic Report, Municipality of Anchorage)

Crash Type Category	Percentage of Crashes (1994 to 2003)	Percentage of Crashes (2003 to 2012)
Rear End and Sideswipe	45%	57.5%
Left Turn, Right Angle, and Head On	47%	30%
Other	2%	7%
Ran off Road or Struck Object off Road	3%	3.5%
Bicycle and Pedestrian	2%	2%
Animal	1%	0%

Table 2 –Percentage of Crashes by Crash Type, 1994 to 2003 Compared to 2003 to 2012

There were a total of 533 rear end and sideswipe crashes in the study area from 2003 to 2012. Rear end and sideswipe crashes occur most frequently when the lead vehicle slows or stops and the following vehicle does not adjust to the speed change quickly enough. Figure 5 shows that the majority of rear end and sideswipe crashes on this corridor occur when vehicles are traveling along University Avenue (northbound or southbound). About 40% of the northbound and southbound rear end and sideswipe crashes occur at signalized intersections. Most of these crashes occur when the signal changes and the lead car stops abruptly or the following car has difficulty stopping. The most common mitigation for this type of crash is to adjust the yellow change and red clearance times to match the Institute of Transportation Engineers (ITE) recommended “Proposed Recommended Practice for Determining Vehicle Change Intervals.” Since ADOT&PF uses the recommended practice to develop signal timing, this project is not expected to affect the number of rear end crashes at signalized intersections. The other 60% of the northbound and southbound rear end and sideswipe crashes occur at uncontrolled locations. Most of these crashes occur when the lead vehicle slows or stops to make a turn. Left turns on 4-lane sections where the roadway is undivided are especially problematic because the turning vehicle must sit in the inside through lane while awaiting a safe gap. The proposed design will install a center raised median on University Avenue and channelized left turn lanes at all median openings. This will help remove turning vehicles from the through lanes, which is expected to reduce crashes. The expected crash reduction is presented for each intersection individually.

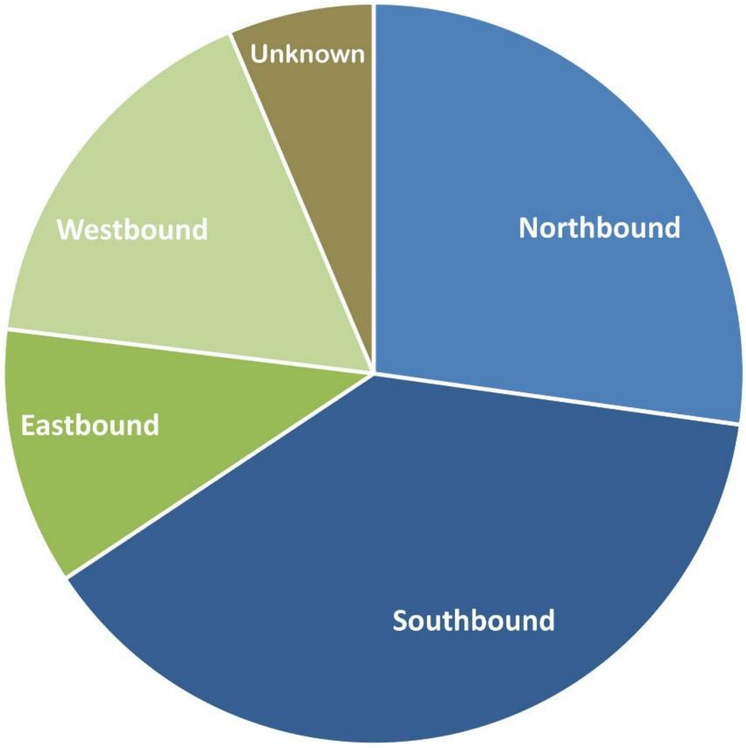

Figure 5 – Travel Direction for Corridor Rear End and Sideswipe Crashes, 2003 to 2012

2.2 Roadway Lighting

Approximately one-third of all corridor crashes occurred during periods of darkness. Figure 6 shows how crashes were distributed throughout the day by month of the year and by reported lighting condition. In the figure, bins with darker shading indicate time periods where there were more crashes throughout the study period. Two patterns are apparent in the figure: crashes tend to be concentrated in the PM peak period (when traffic is heaviest) and crashes are concentrated in the winter months, regardless of lighting condition. From this, it does not appear that street lighting is a contributing factor to the crashes on this corridor. The proposed design will replace the continuous lighting in the corridor to maintain standard lighting levels with the widening of the roadway.

	January			February			March			April			May			June			July			August			September			October			November			December		
	Dark	Twilight	Daylight	Dark	Twilight	Daylight	Dark	Twilight	Daylight	Dark	Twilight	Daylight	Dark	Twilight	Daylight	Dark	Twilight	Daylight	Dark	Twilight	Daylight	Dark	Twilight	Daylight	Dark	Twilight	Daylight	Dark	Twilight	Daylight	Dark	Twilight	Daylight	Dark	Twilight	Daylight
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7:00 AM	9		1	2		1	1	1	3						2						1		1	2			1				4	1		1		
8:00 AM	4			2		3	1		1						1			1			3		1	2			1			3	2		1	4		
9:00 AM		1	2			4						2						2						1			2			2						
10:00 AM		1	3			5									1			1			3			2						1			3	1		2
11:00 AM	1		10			7			1			1			2			2			2			1			2			4			3			4
12:00 PM			6			10			1			5			1			5			4			2			1			6			1			9
1:00 PM			11		1	11			4			2			2			1			4			6			4			3			9			18
2:00 PM			11			15			2			3			4			2			1			5						5	1		11	1	3	9
3:00 PM		2	12			13			5			2			5			5			5						5			11			7	4	3	6
4:00 PM	15	1	4	2	3	14			4			4			2			5			1			3			4		2	7	3		3	17	2	
5:00 PM	27	2	1	3	9	3			5			7			7			8			6			9			8		1	2	18	2		19	3	
6:00 PM	16			3	1	1		2	3			2			2			6			2			3			5			3	5	1		11		
7:00 PM	5			5			3				1	1			1			2			1		1	7	2		3	6	1		5			5		
8:00 PM	5			2														5		1				2	2		1	3		1	1			5		
9:00 PM	2			2											1			3			1							1		1	3			5		
10:00 PM	1			3			2			1					1		1				1		1		1						7			1		
11:00 PM	4			1			1							1								1						2			2			1		

"Dark" Crashes (darker colors indicate more crashes)

"Twilight" Crashes (darker colors indicate more crashes)

"Daylight" Crashes (darker colors indicate more crashes)

Figure 6 – Number of Crashes by Time of Day, Month of Year, and Lighting Condition, 2003 to 2012

2.3 Roadway Surface Condition

For almost 30% of all crashes, the road surface was identified as a contributing factor in the crash. The road surface condition at the time of the crash was identified as “ice” for over 80% of these crashes. Figure 7 shows the road surface condition for each of the 926 crashes in the study area. It is clear from the figure that ice, slush, and snow are correlated with the increased number of crashes in the winter months.

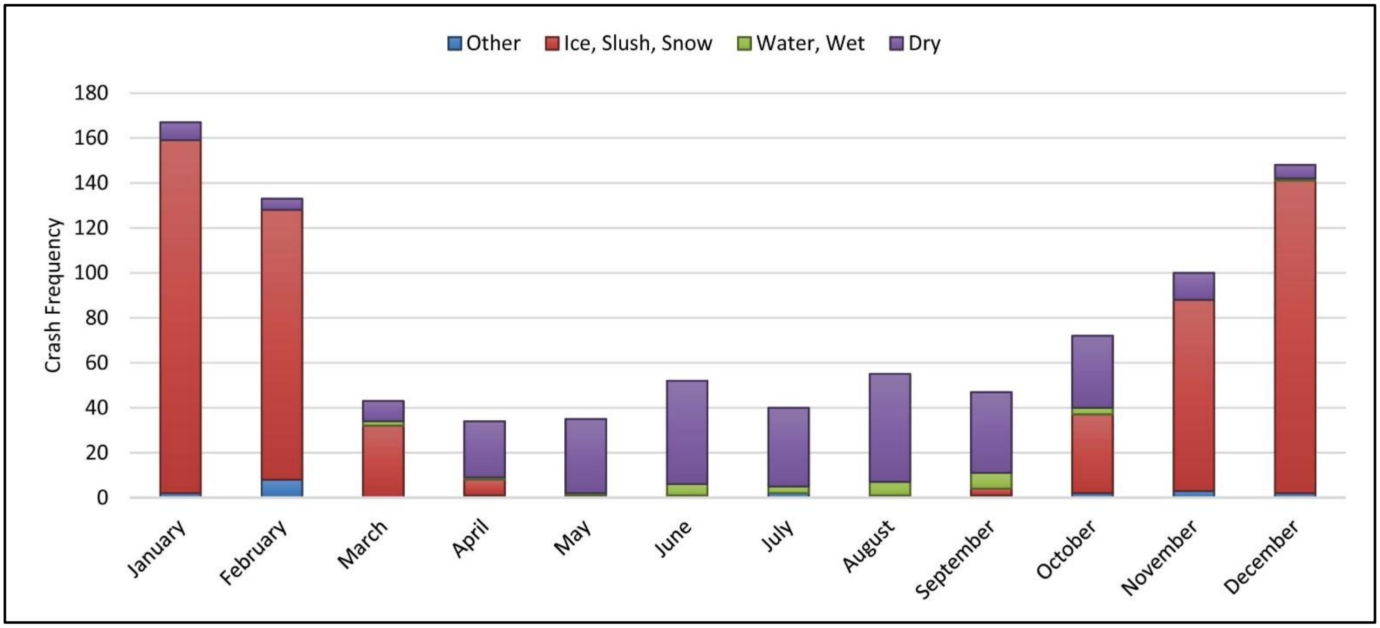

Figure 7 - Crashes by Road Surface Condition and Month, 2003 to 2012

2.4 Pedestrian and Bicycle Crashes

There were 3 pedestrian crashes and 16 bicycle crashes in the study area between 2003 and 2012. The vehicle was turning right in 2 of the pedestrian crashes and in 7 of the bicycle crashes. This is a common crash type where the vehicle driver is looking to their left to see if there is a gap in traffic and fails to see a pedestrian or bicyclist coming from their right. Features of the proposed design that are expected to improve safety for pedestrians and bicyclists include right turn channelizing islands (to be installed at Airport Way and at University Avenue) and bicycle lanes. It is expected that the bicycle lanes will help make bicyclists more visible to motorists and will reduce conflicts between bicyclists and pedestrians.

3 Intersection Crashes

The majority of corridor crashes (868 crashes) occur at intersections. Crash rates were calculated for each of the study area intersections. Intersections with higher than average rates are not necessarily significant problems. An upper control limit, or critical rate, is the threshold of concern. The Rate Quality Control Method establishes an upper control limit (UCL) to determine if a facility's crash rate is significantly higher than crash rates in facilities with similar characteristics. The UCL is determined statistically as a function of the statewide average crash rate for a facility and the vehicle exposure at the location being studied. Facilities with rates that exceed the UCL are inferred to be above the population average at the stated confidence level, so that the observed high crash experience is not likely to be due solely to chance. Table 3 shows the crash rate for each intersection and highlights those intersections where the crash rate is above or very close to the UCL.

Intersection	Number of Crashes	Average Entering AADT	Crashes / MEV	Control Type	State Average	Upper Control Limit at 95% Confidence	Above Average?	Above Critical (UCL)?
Davis Road	29	10,946	0.726	Stop	0.522	0.723	yes	yes
Holden Road	3	10,238	0.080	Stop	0.522	0.730	no	no
19th Avenue	2	10,290	0.053	Stop	0.522	0.729	no	no
Swenson Avenue	2	10,278	0.053	Stop	0.522	0.729	no	no
Erickson Avenue	24	11,344	0.580	Stop	0.636	0.852	no	no
Mitchell Avenue	6	10,258	0.160	Stop	0.522	0.730	no	no
Rewak Drive	46	16,521	0.763	Signal	1.376	1.633	no	no
Airport Way	230	34,006	1.853	Signal	1.376	1.553	yes	yes
Geraghty Avenue	46	19,970	0.631	Stop	0.522	0.668	yes	no
Goldizen Avenue	17	18,344	0.254	Stop	0.522	0.675	no	no
Widener Lane	24	18,254	0.360	Stop	0.522	0.675	no	no
Indiana Avenue	35	18,361	0.522	Stop	0.522	0.675	yes	no
Wolf Run	18	18,270	0.270	Stop	0.522	0.675	no	no
Geist / Johansen Expressway	287	39,106	2.011	Signal	1.376	1.541	yes	yes
Sandvik Street	59	20,446	0.791	Stop	0.636	0.795	yes	no
Cameron Street	6	20,221	0.081	Stop	0.522	0.667	no	no
Thomas Street	27	20,127	0.368	Stop	0.522	0.667	no	no

Table 3 - Intersection Crashes and Crash Rates, 2003 to 2012

3.1 Davis Road

There were 29 crashes at Davis Road during the study period. Figure 8 shows the distribution of crashes by year. Figure 9 shows the distribution of crashes by crash type.

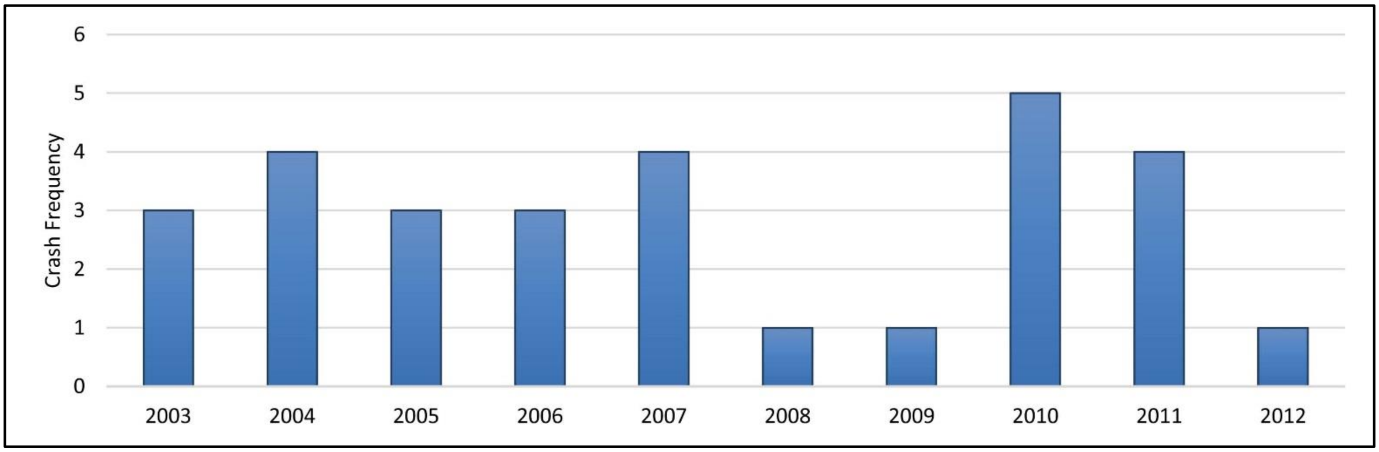

Figure 8 – Crashes per Year at Davis Road Intersection, 2003 to 2012

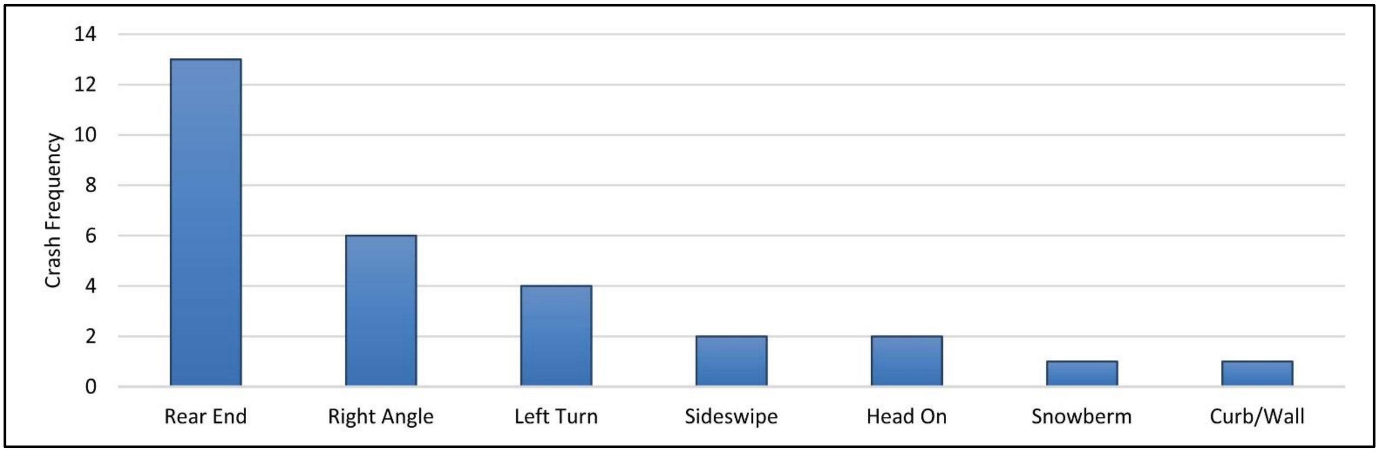

Figure 9 – Crash Types at Davis Road Intersection, 2003 to 2012

Rear end and sideswipe crashes made up the largest category of crashes at this intersection. Of the 15 rear end and sideswipe crashes, 6 involved southbound drivers. These are mostly related to southbound vehicles slowing or stopping to turn left onto Davis Road. The proposed design would install a southbound left turn lane at this intersection. According to the Highway Safety Improvement Program (HSIP) Handbook, installing a southbound left turn lane will reduce southbound rear end and sideswipe crashes at this location by 55% (a reduction of 3 to 4 crashes).

The next highest category of crashes occurring at this intersection is right angle and left turn crashes, which account for 10 crashes during the study period. One possible crash mitigation for these types of crashes is through the installation of a traffic signal, which has been proposed at this intersection; however, there is not a sufficient right angle crash pattern to satisfy a crash-based traffic signal warrant.

3.2 Erickson Avenue

This intersection does not currently have a higher than average crash rate; however, a history of southbound rear end crashes related to left turning vehicles led to the installation of a southbound left turn lane in 2008. Figure 10 shows the distribution of crashes at this intersection by year from 2003 to 2012. The figure clearly shows a significant reduction in rear end and sideswipe crashes after the left turn lane was constructed in 2008. This safety benefit will be maintained under the proposed design.

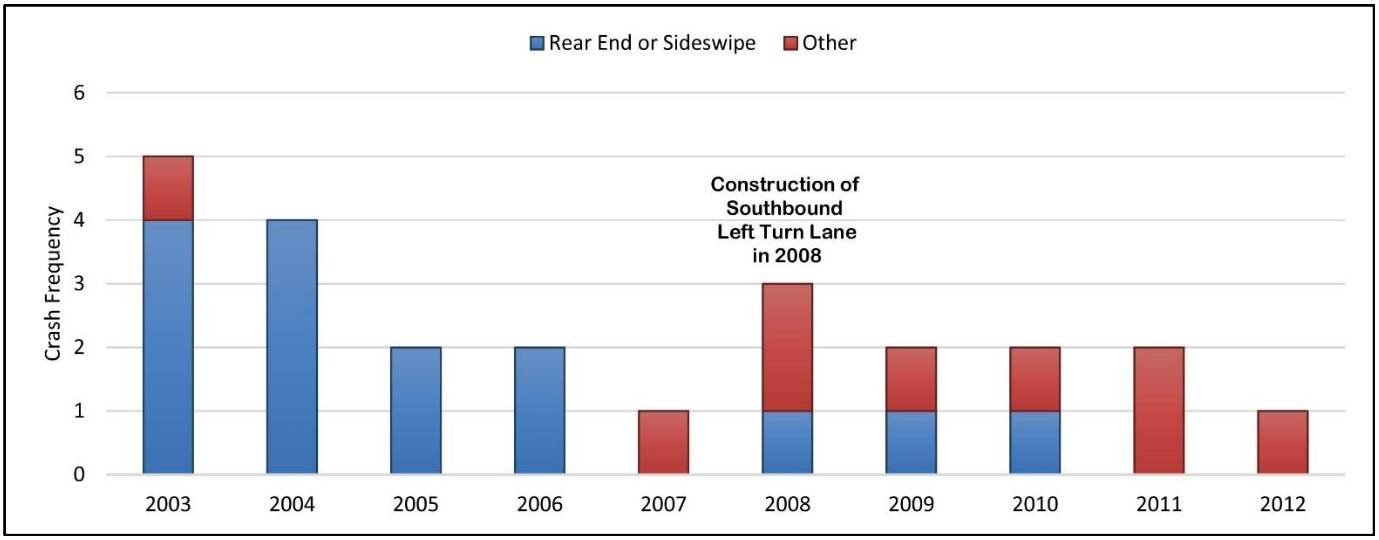

Figure 10 – Crashes per Year by Crash Type at Erickson Avenue Intersection, 2003 to 2012

3.3 Airport Way

There were 230 crashes at Airport Way in the study period. Figure 11 shows the distribution of crashes by year. Figure 12 shows the distribution of crashes by crash type.

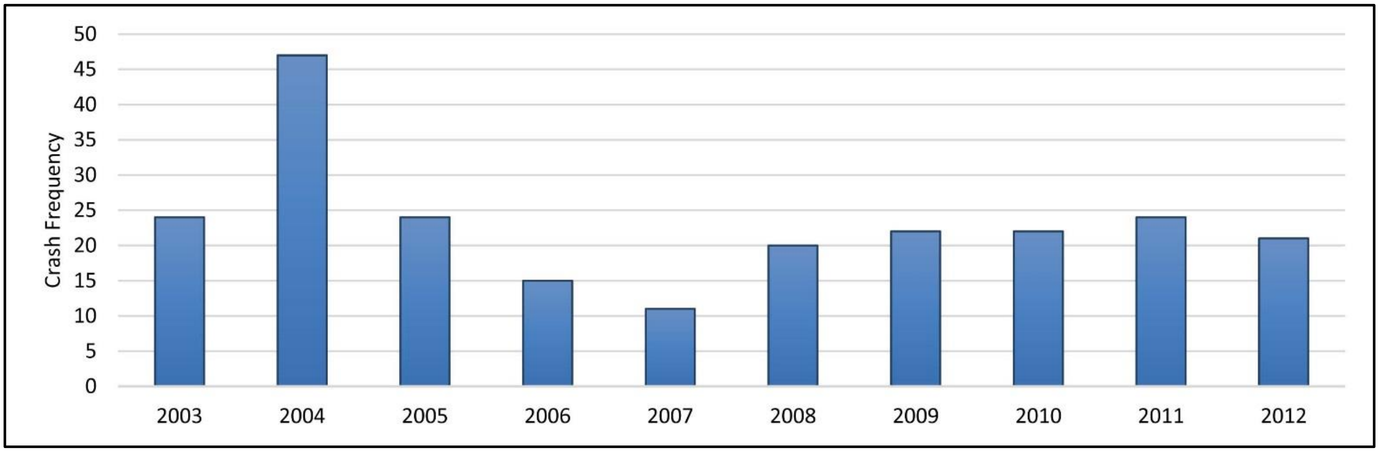

Figure 11 – Crashes per Year at Airport Way Intersection, 2003 to 2012

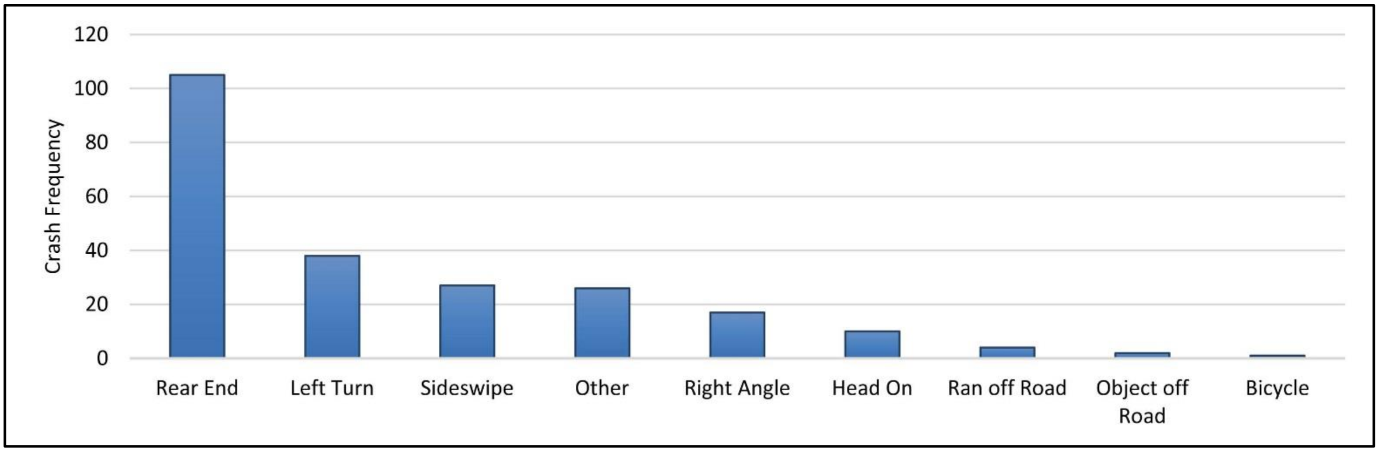

Figure 12 – Crash Types at Airport Way Intersection, 2003 to 2012

Just over half of all crashes at Airport Way were rear end crashes. Rear end crashes are evenly distributed across all approaches to this intersection and are most likely related to the change of the signal phase from green to yellow and then red. The most common mitigation for this type of crash is to adjust the yellow change and red clearance times to match the ITE-recommended “Proposed Recommended Practice for Determining Vehicle Change Intervals.” Since ADOT&PF already uses the recommended practice to develop signal timing, this project is not expected to affect the number of rear end crashes at this location.

Left turn crashes make up nearly 20% of the crashes at this intersection. Thirty-five of the 38 left turn crashes involve eastbound or westbound vehicles turning left. Under the existing conditions, these are protected-permitted left turn movements. Vehicles in opposing left turn lanes block the view of left turn drivers, making it difficult to determine if there is an adequate gap to complete the left turn maneuver. Under the proposed design, left turns will still operate protected-permitted for all left turn movements; however, all of the left turn lanes will be positively offset so that left turn drivers will have sufficient sight distance to see past stopped vehicles in the opposing left-turn lane and determine if there is an adequate gap to complete the left turn maneuver. According to the Crash Modification Factors Clearinghouse, this is expected to reduce the number of left turn crashes by 38% (a reduction of 14 to 15 crashes).

The bicycle crash at this location occurred in June 2012 when a bicyclist traveling eastbound was struck by a southbound passenger car that was turning left.

3.4 Geist Road / Johansen Expressway

There were 287 crashes at the Geist Road / Johansen Expressway intersection during the study period. Figure 13 shows the distribution of crashes by year. Figure 14 shows the distribution of crash types.

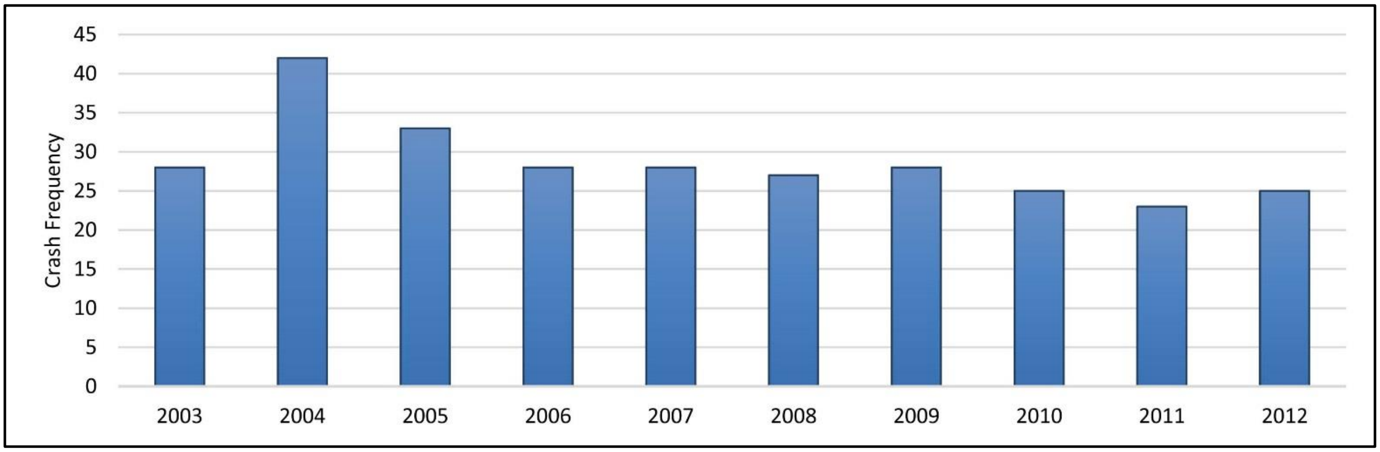

Figure 13 – Crashes per Year at Geist Road / Johansen Expressway Intersection, 2003 to 2012

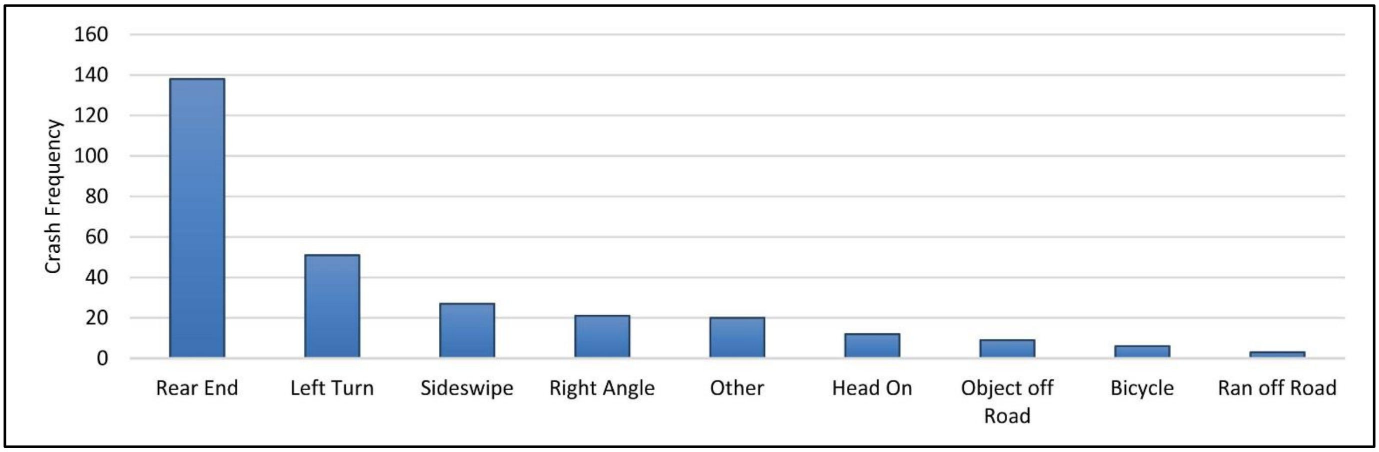

Figure 14 – Crash Types at Geist Road / Johansen Expressway Intersection, 2003 to 2012

Almost half of all crashes at Geist Road/Johansen Expressway are rear end crashes. Rear end crashes are evenly distributed across all approaches to this intersection and are most likely related to the change of the signal phase from green to yellow and then red. The most common mitigation for this type of crash is to adjust the yellow change and red clearance times to match the ITE-recommended "Proposed Recommended Practice for Determining Vehicle Change Intervals." Since ADOT&PF already uses the recommended practice to develop signal timing, this project is not expected to affect the number of rear end crashes at this location.

Left turn crashes make up nearly 20% of the crashes at this intersection. Forty of the 51 left turn crashes at this intersection involved eastbound or westbound vehicles turning left. As with the Airport Way intersection, these are protected-permitted left turn movements. Frequently, vehicles in opposing left turn lanes block the view of left turn drivers, making it difficult to determine if there is an adequate gap to complete the left turn maneuver. Under the proposed design, an additional left turn lane will be installed on all approaches (dual turn lane), requiring the left turn phasing to be converted to protected-only thereby removing the driver error associated with selecting inadequate gaps during a permissive phase. According to the Highway Safety Manual (HSM) published by the American Association of State Highway and Transportation Officials (AASHTO), this is expected to reduce the total number of crashes by 10% (a reduction of 28 to 29 crashes of various crash types).

There were 6 bicycle crashes and no pedestrian crashes at this intersection during the study period. This is the largest concentration of bicycle crashes in the corridor. Four of the 6 crashes involved a right-turning vehicle. This is a common crash type where the vehicle driver is looking to their left to see if there is a gap in traffic and fails to see a pedestrian or bicyclist coming from their right. Under the proposed design, right turn channelizing islands will be constructed for northbound vehicles and for westbound vehicles. One advantage of this design is that it allows turning vehicles to first interact with pedestrians and bicyclists at the crosswalk before moving forward and interacting with the cross traffic. At the crosswalk, the vehicle and pedestrian paths are perpendicular to each other, improving the visibility of pedestrians and vehicles to each other. The National Cooperative Highway Research Program (NCHRP) recently published NCHRP w208: Design Guidance for Channelized Right-Turn Lanes. This study found that locations with right turn lanes that are not channelized have 70 to 80% more pedestrian crashes than locations with channelized right turn lanes (a reduction of about 2 pedestrian or bicycle crashes).

3.5 Sandvik Street

There were 59 crashes at the Sandvik Street intersection during the study period. Although the crash rate at Sandvik Street is below the UCL, it is very close to the UCL; therefore, the crashes at Sandvik Street were examined as if the crash rate were above the UCL. Figure 15 shows the distribution of crashes by year. Figure 16 shows the distribution of crash types.

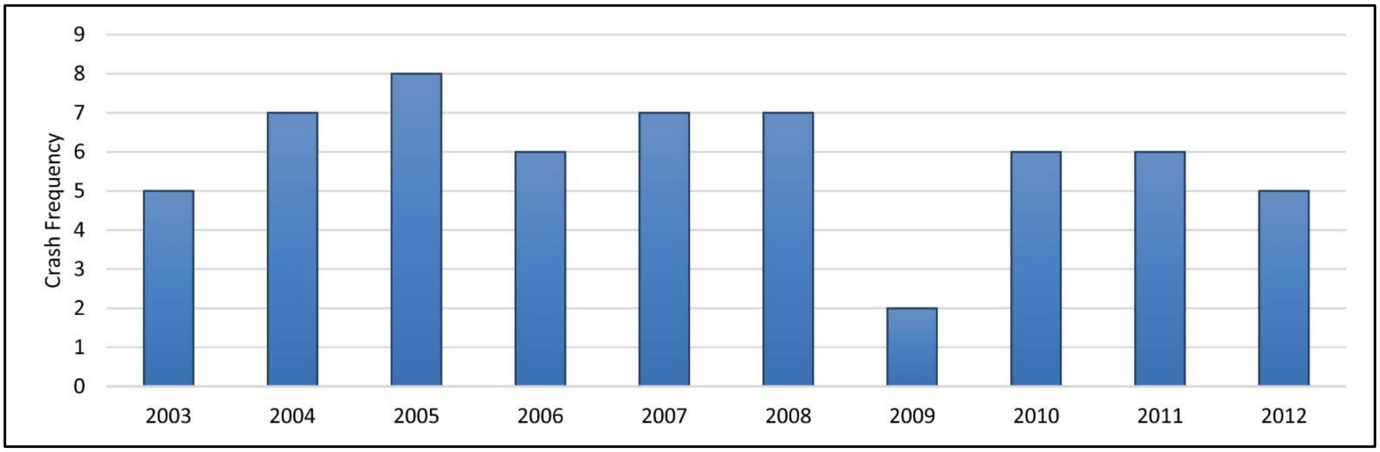

Figure 15 – Crashes per Year at Sandvik Street Intersection, 2003 to 2012

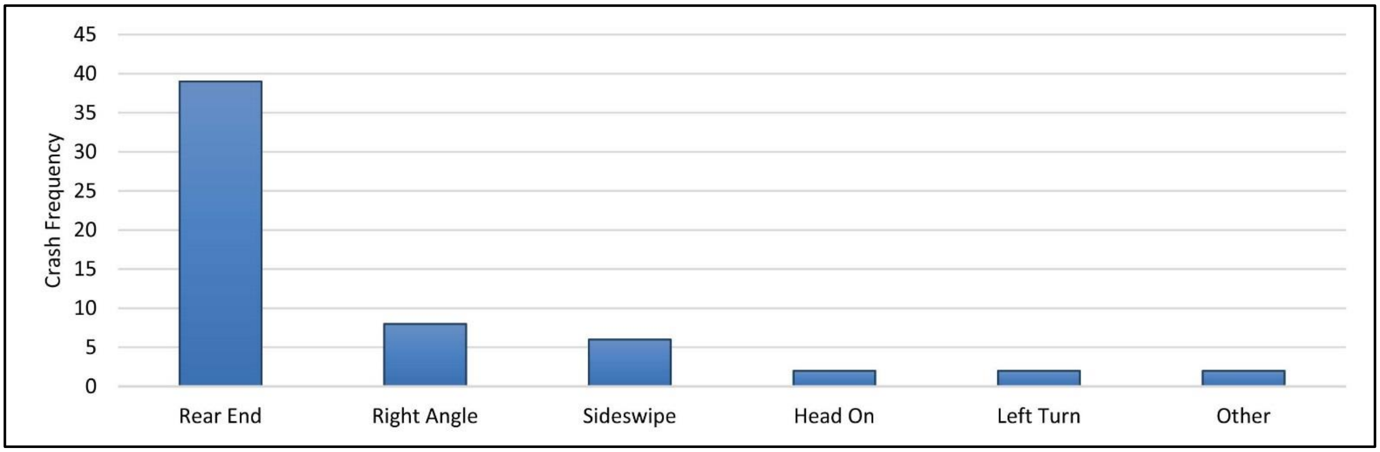

Figure 16 – Crash Types at Sandvik Street Intersection, 2003 to 2012

Approximately 66% of the crashes at this location are rear end crashes. Of the 45 rear end crashes, 40 involved northbound or southbound drivers. Many of these crashes indicate that the lead vehicle was slowing, stopping, or turning. The proposed design will construct left turn lanes at this intersection. This will allow left turning traffic to move out of the travel lanes as they slow down or stop before completing their turn. According to the HSIP Handbook, installing a southbound left turn lane will reduce rear end and sideswipe crashes at this location by 50% (a reduction of 20 crashes).

The next highest category of crashes occurring at this intersection is right angle and left turn crashes, which account for 10 crashes during the study period. One possible crash mitigation for these types of crashes is a traffic signal, which has been proposed at this intersection; however, there is not a sufficient right angle crash pattern to satisfy a crash-based traffic signal warrant.

Sandvik Street provides access to two high schools – Hutchison Institute of Technology and West Valley High School; however, the ages of at-fault drivers involved in crashes at Sandvik Street mirror the ages of at-fault drivers throughout the corridor, indicating that there is not a specific crash concern related to the high school students at this intersection. (See Figure 17.)

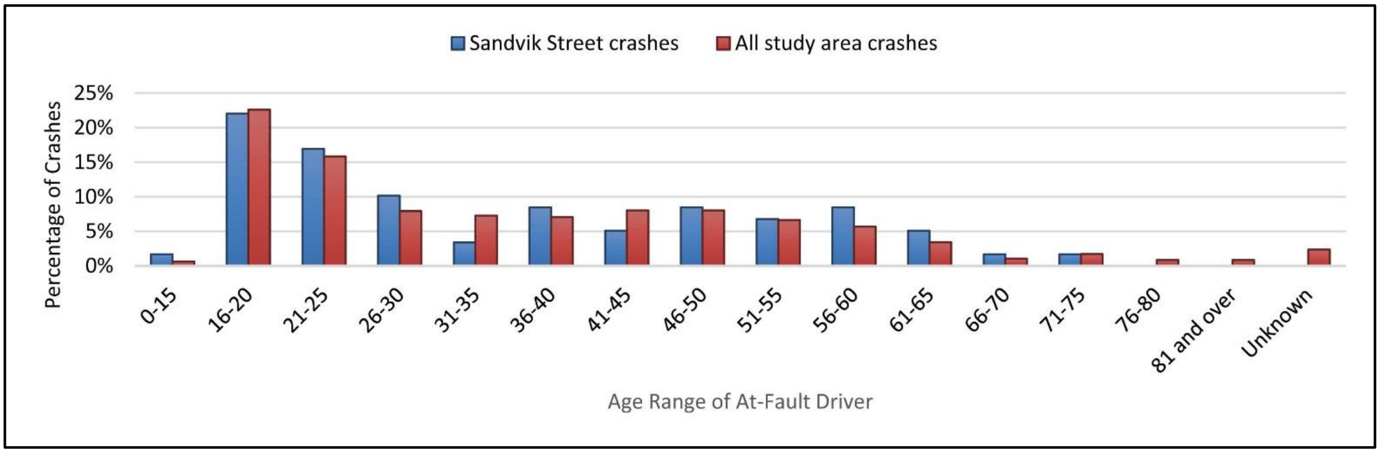

Figure 17 – Age of At-Fault Drivers, Sandvik Street Compared to Study Area, 2003 to 2012

The existing pedestrian overcrossing structure over University Avenue just south of Sandvik Street is to be removed as part of the proposed University Avenue upgrades. The structure used to serve an elementary school on the west side of University Avenue north of Sandvik Street; however, the school has since been converted to a university facility. As such, the removal of the structure will not have an effect on school walking routes. Observations of this intersection during school dismissal time for the high schools showed that some high school students use the overpass to cross University Avenue and others cross at-grade at mid-block locations north of Sandvik Street. With the proposed design, students will have the choice of walking 1/8 of a mile to the signal at Geist Road or to cross at an uncontrolled crossing. To aid those who choose to use the uncontrolled crossing, it is desirable to provide a minimum 6-foot median for pedestrian refuge.

4 Segment Crashes

There were 66 segment crashes that cannot be attributed to an intersection during the study period. Crash rates were calculated for each of the study area segments. Segments with higher than average rates are not necessarily significant problems. An upper control limit, or critical rate, is the threshold of concern. The Rate Quality Control Method is used to establish an upper control limit (UCL) to determine if a facility's crash rate is significantly higher than crash rates in facilities with similar characteristics. Facilities with rates that exceed the UCL are inferred to be above the population average at the stated confidence level, so that the observed high crash experience is not likely to be due solely to chance. Table 4 shows the crash rate for each segment. For none of the segments is the crash rate above or very close to the UCL.

As shown in Figure 18, rear end crashes make up the majority of the segment crashes for this corridor. Of the 42 rear end crashes, 38 crashes involved northbound or southbound drivers. Many of these crashes indicate that the lead vehicle was slowing, stopping, or turning. The proposed design will construct a center median restricting left turn access to median openings with left turn lanes. This will allow left turning traffic to move out of the travel lanes as they slow down or stop before completing their turn. This improvement is expected to reduce segment rear end crashes by 33%.

There were 3 bicycle and 2 pedestrian crashes attributed to segments in the corridor. The majority of these occurred at driveway locations, with a vehicle entering the travel way. The proposed design will construct bicycle lanes, which will make faster moving bicycles more visible to motorists. It is unknown what effect bicycle lanes will have on the number of bicycle crashes.

Intersection	Number of Crashes	Segment Length (Miles)	Average Entering AADT	Crashes / MVM	State Average	Upper Control Limit 95% Confidence	Above Average ?	Above Critical (UCL)?
Mitchell Expressway to Davis Road	0	0.253	6,432	0.000	2.119	3.186	no	no
Davis Road to Rewak Drive	0	0.515	10,190	0.000	2.119	2.692	no	no
Rewak Drive to Airport Way	15	0.142	19,354	1.495	2.119	2.925	no	no
Airport Way to Geraghty Avenue	0	0.034	19,354	0.000	2.119	3.872	no	no
Geraghty Avenue to Goldizen Avenue	27	0.452	19,354	0.846	2.119	2.558	no	no
Goldizen Avenue to Geist Road/Johansen Expressway	0	0.375	18,222	0.000	2.119	2.618	no	no
Geist Road/Johansen Expressway to Sandvik Street	7	0.16	20,021	0.599	2.119	2.862	no	no
Sandvik Street to Cameron Street	17	0.142	20,021	1.638	2.119	2.910	no	no
Cameron Street to Alumni Drive/College Road	0	0.154	20,021	0.000	2.119	2.877	no	no

Table 4 – Segment Crashes and Crash Rates, 2003 to 2012

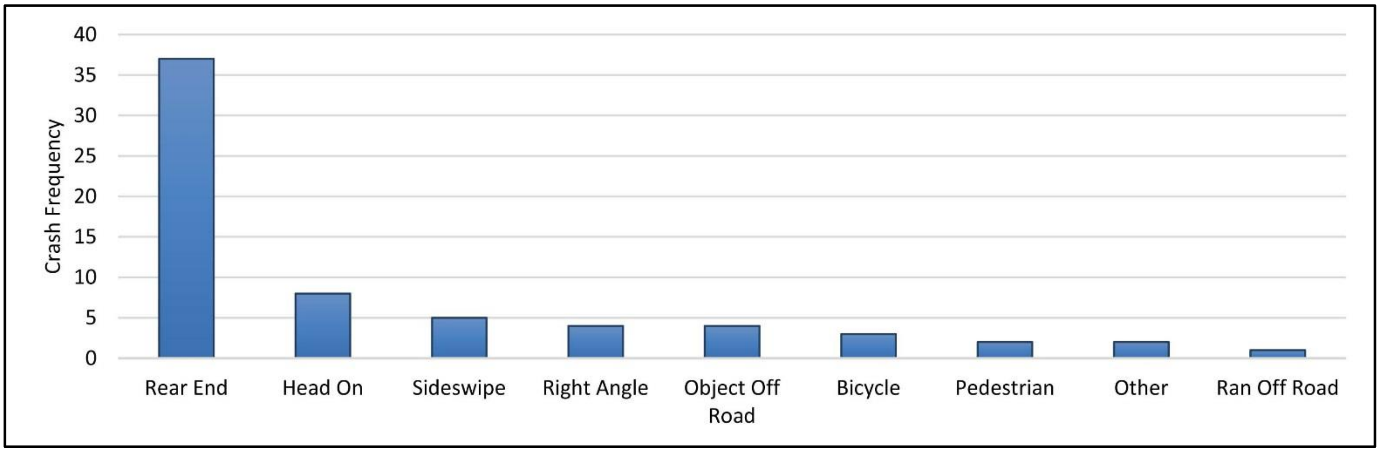

Figure 18 – Crash Types for Segment Crashes, 2003 to 2012

5 Summary

The University Avenue Rehabilitation and Widening project will widen the existing four-lane highway to include a raised median, with median openings and channelized left turn lanes at key intersections. The signalized intersections of Airport Way and Geist Road/Johansen Expressway will be upgraded to make safety and operational improvements. Although earlier designs included plans for signal installations at the Davis Road and Sandvik Street intersections, recent analyses have found that signal warrants are not met at these intersections; therefore, the current design does not include signalization of these two intersections. This report corroborates that the crash experience at these two intersections does not suggest a need for signalization.

This report analyzes the 926 reported crashes in the project corridor from 2003 through 2012 and identifies locations with higher than expected crash rates, crash patterns at these locations, and expected crash reductions based on the proposed design. The crash reduction factors that were used are shown in Table 5. Table 6 summarizes the crash reduction that would have occurred if the proposed design had been in place during the study period.

Proposed Design Features	Crash Reduction Factors	Crash Types	Reference
Center Raised Median	-20%	Cross over and segment access-related collisions.	HSIP Handbook
Install Left Turn Lanes on Major Road	-55% (3-Leg Intersection) -50% (4-Leg Intersection)	Rear ends and sideswipes on major road	HSIP Handbook
Provide Offset for Existing Left Turn Lanes	-38%	Left turn crashes from major road	Crash Modification Factors Clearinghouse
Change Left Turn Phasing to Protected-Only	-10%	All	AASHTO HSM
Channelized Right Turn	-55%	Pedestrian or bicycle crashes with right-turning vehicles	NCHRP w208

Table 5 – Crash Reduction Factors Associated with Design Features

Segment or Intersection	2003 to 2012 Crash Frequency	Crash Rate Statistically Higher than Average?	Proposed Design Features	Crash Reduction Over Study Period
Mitchell Expressway to Davis Road	0	No	Center Raised Median	0
Davis Road	29	Yes	SB Left Turn Lane	3 to 4
Davis Road to Rewak Drive (and minor intersections)	37	No	Center Raised Median, Median Opening with Left Turn Lane at Holden, Erickson	7 to 8
Rewak Drive	46	No	Offset Left Turn Lanes	2 to 3
Rewak Drive to Airport Way	14	No	Center Raised Median	1 to 2
Airport Way	230	Yes	Offset Left Turn Lanes	14 to 15
Airport Way to Geraghty Avenue	0	No	Center Raised Median	0
Geraghty Avenue	46	No	Center Raised Median (Right-in-right-out only)	4
Geraghty Avenue to Goldizen Avenue	27	No	Center Raised Median	0 to 1
Goldizen Avenue	17	No	Median Opening with Left Turn Lane	6 to 7
Goldizen Avenue to Geist Road/Johansen Expressway (and minor intersections)	77		Center Raised Median, Median Opening with Offset Left Turn Lane at Indiana	26 to 27
Geist Road/Johansen Expressway	287	Yes	All Left Turns Protected-Only Phasing	30 to 31
Geist Road to Sandvik Street	7	No	Center Raised Median	0
Sandvik Street	59	Yes?	Offset Left Turn Lanes	20
Sandvik Street to Cameron Street	17	No	Center Raised Median	0 to 1
Cameron Street	6	No	Median Opening with Left Turn Lane	0
Cameron Street to Alumni Drive/College Road	27	No	Center Raised Median to Thomas	0
Total Crash Reduction				**113 to 123**

Table 6 – Crash Reduction if Proposed Design Had Been in Place

6 References

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